

ABSTRACT

A process for forming a semiconductor device with multiple gate insulator thicknesses, wherein exposed surfaces of a semiconductor substrate are protected during a photoresist stripping procedure, has been developed. After growth of an insulator layer on the entire surface of a semiconductor substrate portions of the insulator layer not covered by a photoresist masking shape are selectively removed. A two step photoresist removal procedure is then employed initiating with an ozone water cycle which partially removes the photoresist shape while forming a thin silicon oxide layer on the portions of bare semiconductor surface. A sulfuric acid - hydrogen peroxide mixture (SPM), is then used to complete the photoresist removal procedure including removal of photoresist residues, with the thin silicon oxide layer formed during the ozone water cycle protecting the previously bare underlying semiconductor surface. An oxidation procedure is then performed allowing a first gate insulator layer to be formed incorporating the original insulator layer, and allowing a thinner, second gate insulator layer to be obtained, incorporating the thin silicon oxide layer.